

THURSDAY, APRIL 1, 1880

FOSSIL ECHINODERMS

Handbuch der Palæontologie. Unter Mitwirkung von W. Ph. Schimper, Professor an der Universität zu Strassburg, herausgegeben von Karl A. Zittel, Professor an der Universität zu München. I. Band, iii. Lieferung. Mit 195 Original-Holzschnitten. (München: R. Oldenbourg, 1879.)

MORE than three years ago a notice appeared in these columns (vol. xiv. p. 445) of the first Part of a new treatise on Palæontology by Professors Zittel and Schimper. Of the first volume, that which is devoted to Palæozoology, and is from the pen of Prof. Zittel, three Parts have now been published. The last one, which deals with the fossil echinoderms, fully justifies the great expectations to which the first gave rise, both text and illustrations being of a very high order of excellence.

It commences somewhat abruptly in the middle of a sentence belonging to the introductory chapter on the sub-kingdom generally, the earlier pages of which appeared at the end of Part 2. At the end of the volume, in like manner, there are four pages which contain the first portion of the chapter on the Vermes.

Like most Continental writers, Prof. Zittel divides the Echinoderms into four classes only, viz., Crinoids, Starfishes, Urchins, and Holothurians. The first class is a large one, including the Cystids and Blastoids, as well as the true Crinoids, or *Eucrinoidea*, as Zittel calls them; and very nearly half the book is devoted to it, while the Urchins take up the greater part of the remainder.

Each class is treated separately as regards its general anatomy, terminology, classification, and distribution, both in space and in time. Besides the numerous references scattered through the text, a valuable bibliographical list is appended at the commencement of every section but that on the Holothurians, to which, for obvious reasons, only one page is devoted. In the sections on the Urchins and the Crinoids the results of the *Challenger* Expedition (so far as published) are fully considered, and attention is drawn to the analogy between the recent *Comatula* and the palæozoic Crinoids in the very limited geographical distribution of individual specific forms, and in some cases even of genera.

The chapter on the general anatomy of the Crinoids is fairly complete, except as regards the blood-vascular system, and exceedingly accurate on the whole, though we must take exception to the passage on p. 329, in which it is stated that *all* (*sämmtliche*) living Crinoids have a central mouth and an excentric anal opening. Nearly forty years ago Müller described several *Comatula* with an excentric mouth and a central anal tube. These have been since grouped into the genus *Actinometra*, which includes quite one-third of the species of recent *Comatula*. Almost the only recent work on the Crinoids to which no reference is made is Ludwig's singular suggestion that the genital plates of the Urchins and Asterids are homologous, not with the genitals of the Ophiurids and the basals of the Crinoids, as hitherto supposed, but with the *oral* plates of both these groups. Probably, however, this is only because Ludwig's paper was published too late to

receive the notice which it deserved. To this same category of oral plates Dr. Zittel refers the remarkable "Consolidations-Apparat" in the calyx of *Cupressocrinus* and the corresponding plates which lie above and alternate with the radials in *Cyathocrinus* and allied genera. This appears to us to be a very probable explanation of the homologies of these plates; and we wonder that the so-called "deltoid pieces" of the Blastoids are not regarded by Prof. Zittel in the same light, for they occupy precisely the same position between the radials and the central mouth as the oral plates of *Cyathocrinus*.

Schultze's views as to the subtegmental mouth of the palæozoic Crinoids are of course fully adopted, but the author does not altogether follow Wachsmuth's arrangement of the group according to the three principal plans upon which the vault is constructed; for the vault of the *Taxocrinida* is described as resembling that of the *Cyathocrinida*, whereas, according to Wachsmuth, the structure of the vault is essentially different in the two families. Prof. Zittel also accepts Schultze's views as to the position of the boundary line between the plates of the arms and those of the calyx; and he brings forward a strong piece of evidence in their favour, namely, that according to Dr. Carpenter's observations the first radials of *Comatula* correspond essentially in their origin and mode of growth with the basals and orals, appearing as plate-like films from the first, and that they therefore belong to the calyx. On the other hand, according to Sir Wyville Thomson, the second and third radials do not, like the first, begin as expanded cribriform films, but first appear as horseshoe-shaped spicula or imperfect rings; and Dr. Carpenter has shown that the origin and development of the arm-joints is of essentially the same character. As in the Urchins and Starfishes, therefore, the calyx normally contains but two rows of plates, viz., the radial series above, and below them the inter-radially situated basals; though in some Crinoids there is a third series of plates, the under-basals, which occupy a radial position between the true basals and the top stem-joint.

The author's descriptions of the arms and their appendages do not seem to us to be always quite consistent. In the *Comatula* with ramifying arms all the branches are equivalent. Each of the ten primary arms may fork and give rise to two equal secondaries. Each of these again may bear two equal tertiary arms, and so on, the successive divisions forking altogether perhaps five or six times, and the two divisions borne by any axillary being equal to one another. In some of the stalked Crinoids, however, this regular forking ceases with the second axillary, which bears, not two equal tertiary arms, but a smaller one that remains undivided, and a larger one that continues the line of the secondary arm and ends in an axillary joint. This also bears two unequal arm-divisions, and the same mode of branching is continued on each successive axillary. These smaller lateral branches, which may always be on the same side of the main arm trunk, or may alternate on opposite sides, are termed "Nebenäste" by Zittel, who rightly states that they appear when there is no forking. There is therefore a little inconsistency in his describing the arms of *Cyathocrinus* and *Euspirocrinus* as many times or repeatedly forked, while in the diagnosis of the family the arms are described as having "Nebenäste," and the figures of both genera show

that this is the mode of division above the secondary axillaries.

Despite Lütken's arguments to the contrary, Müller's division of the true Crinoids into *Tesselata*, *Articulata*, and *Costata* is adopted with but a few slight modifications, on the ground that it furnishes well-defined natural groups.

The grouping of the families in each sub-order is in great part a new one, though based to some extent on the works of Roemer, Angelin, and Wachsmuth. The sub-order *Tesselata* includes twenty-six families which are arranged in five sections, chiefly according to the structure of the vault, and the relations of the oral plates. Seven of these families are new, while some of those which date from an earlier period have been slightly modified in their extent. The *Articulata* fall into seven families, of which two are new, viz., the *Eugeniocrinida* and *Plicatocrinida*, while the limits of Roemer's family, *Holopodida*, are slightly altered. The recent *Hyocrinus*, which is referred by Sir Wyville Thomson to the *Apiocrinida*, is regarded by Prof. Zittel as most probably identical with *Plicatocrinus*, and the well-known genus *Rhizocrinus* of M. Sars is identified with the very imperfectly described *Conocrinus* of d'Orbigny, the latter name being resuscitated on grounds of priority, while *Rhizocrinus* is reduced to the rank of a synonym. We venture to think that this is somewhat inexpedient, for Sars's name is now universally employed, and there can be no possible doubt as to the characters of the type to which he gave it; whereas Zittel himself admits that d'Orbigny's diagnosis of *Conocrinus* is incomplete and even partially incorrect.

Among the *Comatulida* the fossil *Solanocrinus* with external basals, is retained as a type distinct from that of the recent and fossil *Antedons* which lack this peculiarity, although Schlüter, like others before him, has recently attempted to merge *Solanocrinus* in *Antedon*. There is one portion of the diagnosis of this type in which clearness has been too much sacrificed to brevity. It is as follows. "Dorsal organ (heart) round, without radial pits." The meaning which these words are intended to convey is that the centrodorsal piece has a round central cavity in which the chambered organ (the so-called heart) was lodged, and that there are no radial pits around its opening. In recent *Comatula*, however, the presence or absence of these pits is far too irregular within specific limits to be of any systematic value, while Quenstedt has found them to be sometimes present in *Solanocrinus*, although, according to Zittel, they should be absent.

The Cystids and Blastoids are classified according to the systems proposed by Müller and Roemer respectively. *Agelacrinus* is referred to the Cystids, and not made the type of a new class as is sometimes done in this country; while *Codonaster* is transferred from the Blastoids to the Cystids, in accordance with the views of the late Mr. Billings. *Stephanocrinus*, on the other hand, placed by Roemer among the Cystids, is here regarded as a Blastoid.

The Starfishes are all grouped together into one class, the *Asterioidea*, which contains the two orders *Ophiurida* and *Stellerida*. The palæozoic forms of the latter, with alternating ambulacral plates, are in accordance with Bronn's classification, separated as *Encrinasterida* from the true Stellerids or *Asteria vera*.

These are classified chiefly according to the system of Müller and Troschel, which has been the basis of almost all palæontological work on the group, though the author admits that it requires much revision as regards the recent forms.

The classification of the *Echinoidea*, however, contains some new features. The name *Echinocystites*, proposed by Wyville Thomson in 1864 for a remarkable palæozoic form which he regarded as intermediate between Cystids and Echinids, is discarded in favour of *Cystocidaris*, Zittel, on the ground that Hall used the same name three years later for a true Cystid from the Upper Silurian of Wisconsin. *Cystocidaris* is made the type of a new order which, together with the *Bothriocidarida* and the *Perischoëchinida*, constitute the sub-class *Palechinoidea*, Zittel. Lovén's arrangement of the *Perischoëchinida* is the one adopted, except that the family name *Palaëchinida*, McCoy, gives way to *Melonitida*, Zittel. The other Urchins constitute the sub-class *Euechinoidea*, Bronn, the regular forms being grouped into four families, viz., the *Cidarida*, *Salenida*, *Echinothurida*, and *Glyphostomata*, this last including the sub-families *Diademata* and *Echinida*. In view of the observations of Lovén and Ludwig on the mobility of the plates of the hinder interambulacrum in the *Spatangida* and *Holasterida*, the author does not regard the *Echinothurida* as so clearly related to the *Perischoëchinida* as has been supposed by some writers, but considers the characters of their ambulacral and interambulacral areas to indicate the *Diademata* as their nearest allies.

The primary classification adopted for the irregular Urchins is that of de Loriol, which depends upon the presence or absence of a dentary apparatus. Each of his sub-orders, *Gnathostomata* and *Atelostomata* is made to include three families, those of the first being the *Echinocnida*, d'Orb., the *Conoclypeida*, Zitt., and the *Clypeastrida*, Ag., while in the *Atelostomata* are included the *Cassidulida*, Ag., *Holasterida*, de Loriol, and the *Spatangida*, Ag., as arranged by de Loriol.

The illustrative woodcuts, like those in the earlier Parts of the "Handbook," are remarkably clear and effective, though in a few cases they might, with advantage, have been a trifle larger. Many of them are new and original, while others, especially in the Crinoid section, are copied from the works of the American palæontologists and from Angelin's "Iconographia." The figures of Echini in the latter half are mostly of exceeding merit, while many beautiful analytical diagrams are reproduced from Lovén's "Echinoid Studies."

This Part of the "Handbook," which seems to us fully to keep up the high character of its predecessors, concludes with p. 564 of the first volume. The chapters on the *Vermes*, *Mollusca*, *Arthropoda*, and *Vertebrata* have yet to appear, and will do so, we trust, at no very distant date.

MEDICINE PAST AND PRESENT

Pharmacology and Therapeutics; or, Medicine Past and Present. By Dr. Lauder Brunton, M.D., &c. (London: Macmillan and Co., 1880.)

DURING the last two or three decades, and especially during the last decade, a change has been going on in the doctrines of remedies, that is, in the doctrines of remedies